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EMBRYOLOGY.[1]

Movements of Blastomeres.—In a copiously illustrated and extensive paper on the cleavage of *Ascaris megalocephala* Otto zur Strassen[2] lays special emphasis upon certain movements of the cells of the embryo.

In the living egg most remarkable rearrangements of the material are easily seen when the first four cells glide over one another. In later stages changes in form are traced to movements of the cells that must have taken place though not actually seen but inferred from a very detailed study of preserved material. The author confined his attention chiefly to the ectodermal layer of cells and knowing the pedigree of a very large number of them was able to affirm that the changes in shape that the embryo exhibits are due, in part at least, to an actual migration or rearrangement of cells. Cell division and surface tension are not the only factors concerned in this change of position of the cells; there must be some individual movement of certain cells.

This movement of the cells is regarded as being of the same nature as that observed by Roux in the isolated cells of the frog's egg and is, therefore, designated *Cytotropism.*

The production of form in the development of the Ascaris embryo has then this important factor—a power of cells to move towards one another and thus change the shape of the entire mass. This movement is in addition to any purely mechanical movements due to surface tension and is due either to attraction between cells or to repulsion between cells. In either case it is assumed that chemical influences are at work: that this movement arises from *chemotactic* strains.

The movements are much restricted in that a cell travels its own length at most and is never free from its sister-cell. In fact the two cells that arise from the division of one remain connected and are not to be separated by any intrusion of migrating cells and the author thinks that the movements are probably even more restricted in being merely the rearrangements of two groups of such sister-cells both derived from one parent, being merely readjustments of four grandchildren of one cell! The entire ectoderm may then be regarded as a mosaic of such sets of families of four, each having its own internal readjustments.

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[1] Edited by E. A. Andrews, Baltimore, Md., to whom abstracts reviews and preliminary notes may be sent.

[2] Archiv f. Entwickelungsmechanik, 3, 1896, pps. 27–101, 133--188, Pls. V--IX.

Moving pigment in Eggs.—In a carefully illustrated account[3] of the cleavage of the Planarian, *Polychœrus caudatus* Mark, Dr. E. G. Gardiner describes most remarkable changes in position of peculiar, algalike, pigment bodies which color the eggs orange-red for a certain period. These bodies appear in certain cells and then others, they lie along the lines where cleavage is to take place.

They move up from the centre of the egg to the surface and move from place to place.

Fertilization.—By the use of nitric acid Kostanecki and Wierzejski find that the so-called achromatic substance may be demonstrated with remarkable clearness in the eggs of the pond snail *Physa fontinalis.* In a detailed description[4] of radiations, or stars, of this substance seen during the process of maturation of the egg and during fertilization, illustrated by many remarkable figures of reconstructed sections, the authors give the facts that lead them toward the following hypothetical conception of the true nature of the process of fertilization.

The object of fertilization is the union of the nuclei; but the necessary condition to make this of avail is that the egg be able to continue to divide, to undergo cleavage. This power is brought to it by the new nuclear part of the sperm.

Each sexual cell needs to be supplemented by what the other has and it itself is deficient in. This lack is in the protoplasm.

The egg has large amounts of nutritive material while the sperm has none. The former has thus relatively too little protoplasm to continue dividing by itself. During maturation, by dividing twice to form polar bodies, the egg uses up its remaining power of division and must have this added to it again if it is to cleave at all.

What the sperm brings in to replace the exhausted cleaving powers of the egg is the connecting piece of the sperm, the portion near the head or nucleus, that contains achromatic material centered on the centrosome or speck next the head. This material is the remnant from the achromatic figure of the last cell division in the formation of sperms.

This material is conceived of as concentrated and not, as yet, recognized till it gets into the egg; then it swells up and extend in radii as an umbrella unfolds. As the sperm revolves through 180° after entering the egg the middle piece preceeds the sperm head or male nucleus in its journey towards the female nucleus. The middle piece appears as a star centered about the centrosome and rapidly grows in all direction by "assimilating" the net-work of the egg. Thus the star, so remarkably distinct in these snail eggs, about the centrosome of the sperm is to be regarded as at first of male origin and then as gradually getting control of the net-work protoplasm, or the archoplasm, of the egg so that it is eventually the centre of an entire rearrangement of this egg material focussed about the male centrosome.

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[3] Journal of Morphology, XI, pp. 155–171.

[4] Archiv. f. Mik. Anat., 47, 2, Apl, 1896, pps. 309--379, Pls. 18--2).

The centrosome next the famale nucleus disappears and the star about it is "assimilated" by the star that arose about the male nucleus. Sooner or later the male star and centrosome divide to furnish the two-centered system concerned with division of the cleavage nucleus. The male and female nuclei unite to make the cleavage nucleus and the two protoplasmic stars do all that remain to be done in the subsequent cleavage.

The substitution of the new male system for the effete female system of radiate protoplasm is regarded as so complete that the chromosomes in the female nucleus become subjected to the domination of the male system by the growing male radii attaching themselves to these chromo somes by a process of "assimilation" of the old connections, that the author believes to exist between the female chromosomes and the female centrosomes. It is assumed that this male system is all along connected with the chromosomes of the sperm head and that the contractoin of the radii draw the sperm head toward the female nucleus.

Along with the reduction of the chromosomes in both egg and sperm there is probably a reduction in the mass of so-called achromatic substance so that in fertilization there may well be restitution of the normal amount by a mutual supplying of the deficiency.

It will be seen that this conception of the process of fertilization is that of Boveri except that the centrosome is regarded as of no importance and the surrounding, radiated protoplasm becomes the essential factor for cell division. The authors follow Heidenhain in regarding the centrosome as merely the point of insertion of that active, contractile part of the cell that radiates out from this centre.

PSYCHOLOGY.[1]

The Effects of Loss of Sleep.—Prof. Patrick and Dr. Gilbert, of the University of Iowa, have reported in the *Psychological Review* some experiments on this problem. Three normal subjects were kept awake for a period of ninety hours, without resort to stimulants or other

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[1] Edited by H. C. Warren, Princeton University, Princeton, N. J.